Contribution ID: **23** Type: **Oral**

qT-slicing with multiple jets at the NNLO and NNLL TMD resummation on dijet production

We present two complementary advances toward precision QCD predictions for multi-jet processes at the LHC, both based on observables constructed with the Winner-Take-All (WTA) recombination scheme. First, we develop two generalizations of the transverse-momentum slicing variable q_T applicable to jet final states, enabling a slicing approach for processes like $pp \to 2$ jets. A proof of concept is provided at NLO, along with factorization formulae that pave the way for NNLO extensions, demonstrated explicitly for $e^+e^- \to 2$ jets. The validation of these q_T-like variables crucially relies on the use of WTA axis definition. Second, we perform NNLL resummation for both the $\delta\phi$ and q_T distributions in WTA dijet production, uncovering a novel structure of scale hierarchies in impact-parameter space. We show that large logarithms involving an auxiliary angle ϕ_b can be eliminated through refactorization of the soft function and the introduction of additional scale evolution. Together, these developments advance the theoretical toolkit for precision collider phenomenology involving jet observables.

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Session Classification: Parallel

Track Classification: Three-dimensional structure of the nucleon: transverse momentum dependent parton distributions